AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 137

POLISH P TYPE SINGLE-SEAT FIGHTERS

All-Metal Cull-Type Wing Monoplanes

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POLISH P TYPE SINGLE-SEAT FIGHTERS*

All-Metal Gull-Type Wing Monoplanes

The P.I and P.VIII airplanes differ in the type of engine used, in their wing area and in their landing gears, the other structural details being identical or presenting unimportant variations (Figs. 1, 2, and 3).

The fuselage consists of two principal independent parts joined by chrome-nickel steel fittings and bolts. The front part consists of a strong framework, to which are attached the engine supports and accessories, as well as the wings and landing gear. The rear part, of rectangular cross section, contains the pilot's cockpit and supports the tail surfaces. The rear portion of the fuselage is covered with removable elektron panels. The height of the pilot's seat can be adjusted during flight within a range of 11 cm (4.3 in.). It has a windshield and a board for the instruments which are arranged in two groups at the right and left of the pilot's hand (Fig. 8). The two machine guns are mounted in the middle, directly in front of the pilot. The fuselage is constructed entirely of duralumin sections joined by rivets and sheet-duralumin fittings. The fuselage structure is perfectly rigid and contains no cables nor brace wires.

*From a pamphlet published by the P.Z.L. (Polish National Aircraft Factory).

The metal propeller is driven by a Hispano-Suiza 12 Lb or Mc engine. The oil tank is under the engine, its outside wall forming a radiator. In the P.I the fuel tanks are placed symmetrically in the wings. In the P.VIII the principal tank is situated in the fuselage, while there are two small gravity tanks in the wings. The engine has a removable sheet-elektron housing provided with inspection ports. Access is gained to all parts of the engine by removing the cowling. The engine is separated from the pilot's cockpit by a fire wall. A fire alarm and extinguisher complete the equipment.

The P.I and P.VIII both have two wings of variable section and characteristic curvature. In the P.VIII this curvature is less pronounced than in the P.I. Each wing is attached by two bolts to the sides of the raised portion of the fuselage which is curved to form a prolongation of the upper curve of the wings (Fig. 9). The plan form of the wings is tapering with rounded tips. Each wing is supported by two struts passing from the spars to the lower edge of the fuselage. The wing structure consists of two I spars rigidly braced by ribs to which the corrugated metal covering is attached. The leading edge is made of smooth sheet metal on formers attached to the front spar. It has six inspection ports. Despite their relatively small weight, the wings are exceedingly strong and rigid.

The narrow ailerons have the form of rigid duralumin boxes covering nearly the whole length of the wings. Each aileron

has a single spar in the axis of rotation at a distance of one-fifth its chord from the leading edge and is thus perfectly balanced.

The rear end of the fuselage carries the tail surfaces, consisting of the stabilizer, elevator, fin and rudder. The stabilizer can be adjusted during flight by rotation about its rear spar. It is braced against the lower edge of the fuselage by two adjustable tubular struts. The elevator and rudder are not balanced. These and the ailerons are mounted on ball bearings.

The controls comprise the control stick and rudder bar. The motion of the former is transmitted to the ailerons through two levers, a vertical tube and rigid controls covering the length of the wing spars. The controls are mounted on ball bearings. The control cables are inside the fuselage. There are no pulleys which might impede the cables.

The landing gears of the P.I and P.VIII differ in certain details, although made on the same general principle. Figure 10 gives a good idea of these details, whose advantages are:

1. A wide track,

2. Elimination of axle,

3. Good conditions for the functioning of the oleopneumatic shock absorber placed inside the fuselage near the engine and hence protected from dust and low temperatures.

This landing gear produces very little drag. Before adop-

tion, it was subjected to both static and dynamic tests under specially unfavorable conditions. The suitably loaded fuselage was dropped from a gradually increased height on wooden drums revolving at a peripheral velocity of about 100 km (62 miles) per hour. These tests demonstrated the absolute reliability of the landing gear even in case of a hard landing. It is provided with two P.Z.L. 138 oleopneumatic shock absorbers having a stroke of 10 cm (about 4 in.).

The tail skid is operated simultaneously with the rudder. Strong springs soften to some degree the jolts against the pilot's feet produced by rough ground. The orientable skid facilitates ground maneuvers.

The armament consists of two machine guns mounted in front of the pilot and synchronized with the engine. Their barrels are placed between the two rows of cylinders of the Vee engine. Steel shields protect the engine from enemy bullets and deflect the gases produced by the powder. The triggers are directly under the hand of the pilot, thus facilitating the prompt remedy of any sudden jamming of the mechanism. The ammunition boxes, each containing 800 rounds, as likewise the boxes for the ejected shells, are placed inside, behind the guns.

The Airplanes P.VI and P.VII

The use of radial engines on the P airplanes necessitated the following changes (Figs. 4, 5, 6, and 7):

1. Replacement of the rectangular fuselage by a fuselage of oval section;
2. Attachment of the wings at the median line instead of at the four points on the upper edges of the fuselage;
3. An easily removable sheet-metal engine mount on front end of fuselage;
4. Installation of main fuel tanks inside the fuselage behind the engine.

The fuselage of a P.VI or P.VII consists of two independent parts joined by steel fittings and bolts. The forward part, like the P.I and P.VIII, has a rigid frame made of suitable metal sections with the difference that the front frame is triangular, while the rear frame consists of three triangles joined at their edges. To this body are attached the wings and the engine support.

The after part of the fuselage, which, by reason of the larger diameter of the engine, must be considerably larger than in the P.I and P.VIII, has an oval cross section. The thick metal covering, necessary to avoid injuries in handling on the ground, distributes the stresses, thus obviating the need of internal bracing and affording some saving in weight.

The after part of the fuselage of a P.VI or P.VII consists of four U spars, several main and secondary bulkheads and longitudinal stringers. This framework is covered with sheet dural-

umin and forms a rigid streamlined body, which offers great resistance to torsional stresses.

The fuselage contains the adjustable pilot's seat and the controls. The instruments are conveniently arranged on a suitable board. Due to the relatively large dimensions of the fuselage, the pilot's cabin is roomy and comfortable. The pilot is protected by a windshield. The machine-gun supports are on both sides of cockpit, about halfway up.

The wings of the P.VI and P.VII are similar to those of the P.I and P.VIII with the characteristic curvature at their roots. Like the latter types, they are supported by two pairs of struts. The wings are provided with inspection ports in their leading edges and lower sides.

The ailerons are like those of the P.I. They are balanced and have ball bearings. The tail surfaces are also like those of the P.I. The horizontal stabilizer can be adjusted during flight. The elevator and rudder are not balanced.

The landing gear of the P.VI and P.VII is like that of the P.VIII. The tail skid is rigidly connected with the rudder. Both landing gear and tail skid are provided with P.Z.L. oleo-pneumatic shock absorbers.

Two machine guns, synchronized with the engine, are mounted on the P.VI and P.VII not in front of the pilot, as in the preceding types, but quite low on both sides of the pilot's cockpit. The triggers of the guns are easily accessible during flight.

There are large inspection ports in the fuselage which render the inspection of the guns exceptionally easy on the ground.

The engines on the P.VI and P.VII are cowled differently, now consisting of:

1. A partially open cowling in which the cylinder heads are exposed to the direct action of the air. This type can be supplemented by a Townend ring.

2. A closed cowling completely enclosing each individual cylinder. This cowling has an elongated frontal orifice through which the air is directed toward the interior of the cowling by means of partitions so disposed as to insure the best possible cooling of the cylinder heads and exhaust valves.

In both systems complete access may be had to the cylinders by removing the cowlings. The second type of cowling gives excellent results from both the fineness and thermal viewpoints. Its only disadvantage consists of certain difficulties in making the cowlings. The first type is much easier to make, but does not give so great fineness. It is to be recommended, however, because of its simplicity and greater facility of removal.

The N.A.C.A. cowling can also be used.

Characteristics of the P Type Airplanes

Airplane			P.I	P.VI	P.VII	P.VIII
Engine			Hispano-Suiza 600 hp	Bristol Jupiter VI FH	Bristol Jupiter F.VII	Hispano-Suiza 12 Mc
Span		m ft.	10.850 35.60	10.300 33.79	10.300 33.79	10.400 34.12
Height		m ft.	2.780 9.12	2.750 9.02	2.750 9.02	2.750 9.02
Length		m ft.	6.980 22.90	7.160 23.49	7.160 23.49	7.100 23.29
Wing area		m^2 sq.ft.	19.5 204.51	17.3 186.22	17.3 186.22	17.6 189.44
Speed at	0 m 0 ft.	km/h mi./hr.	302 187.7	292 181.4	280 174.0	316 196.4
" "	2000 m 6560 ft.	km/h mi./hr.	293 182	290 180.2	300 186.4	312 193.9
" "	5000 m 16400 ft.	km/h mi./hr.	284 176.5	281 174.6	325 201.9	300 186.4
Climb to	2000 m 6560 ft.	time	2' 40"	2' 50"	3'	2' 10"
" "	5000 m 16400 ft.	"	9'	9' 15"	9'	8' 30"
" "	8000 m 26247 ft.	"	29'	33'	17'	28'
Ceiling		m ft.	8600 28215	9000 29527	10500 34449	9000 29527
Minimum speed near ground		km/h mi./hr.	102 63.4	103 64.0	104 64.6	106 65.9
Safety factor			13.5	13.5	13.5	13.5

Load Distribution

Airplane		P.I	P.VI	P.VII	P.VIII
Total weight	kg lb.	1580 3483	1340 2954	1360 2998	1390 3064
Weight of glider	kg lb.	434 957	374 825	374 825	359 791
Power plant	kg lb.	684 1508	509 1122	529 1166	600 1323
Fuel load	kg lb.	254 560	250 550	250 550	224 494
Useful load	kg lb.	208 459	207 456	207 456	207 456
		Equipment			
Speed indicator		1	1	1	1
Altimeter		1	1	1	1
Clock		1	1	1	1
Compass		1	1	1	1
Tachometer		1	1	1	1
Compressor manometer				1	
Oil "		1	1	1	1
Fuel "		1	1	1	1
Oil thermometer (inflow)			1	1	
" " (outflow)		1	1	1	1
Fuel gauge		1	1	1	1

Equipment (cont'd)

Airplane	P.I	P.VI	P.VII	P.VIII
Fire extinguisher	1	1	1	1
Oxygen apparatus	1	1	1	1
Starter	1	1	1	1
Starting magneto	1	1	1	1

Translation by Dwight M. Miner,
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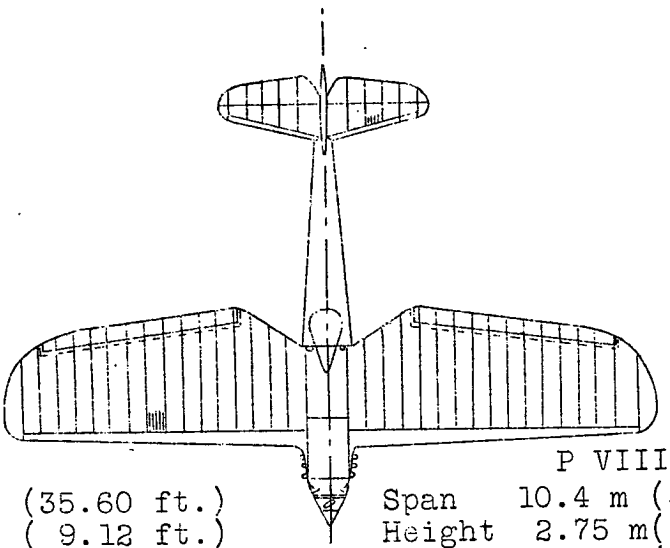
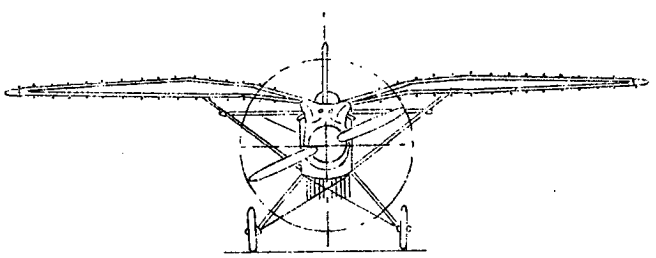


	P I	P VIII
Span	10.85 m (35.60 ft.)	10.4 m (34.12 ft.)
Height	2.78 m (9.12 ft.)	2.75 m(9.02 ft.)
Length	6.98 m (22.90 ft.)	7.10 m(23.29 ft.)
Wing area:	19.5 m^2 (204.51 sq.ft.)	17.6 m^2(189.44 sq.ft.)



P VIII
Hispano-Suiza
12 Mc
engine

P I
600 hp
Hispano-Suiza
12 Lb or Me
engine

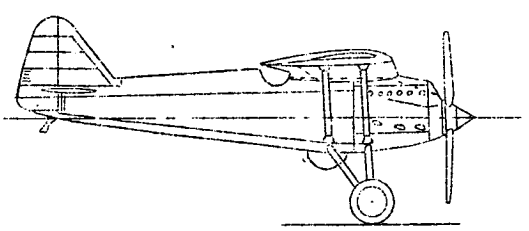


Fig.1 The P I and P VIII single-seat-fighter airplane.

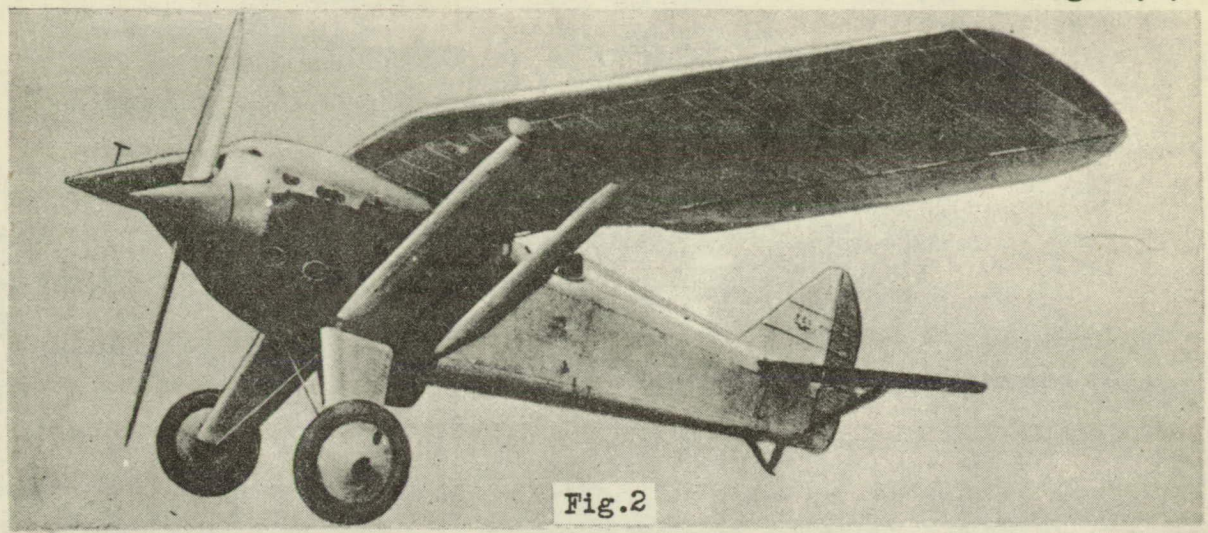


Fig.2

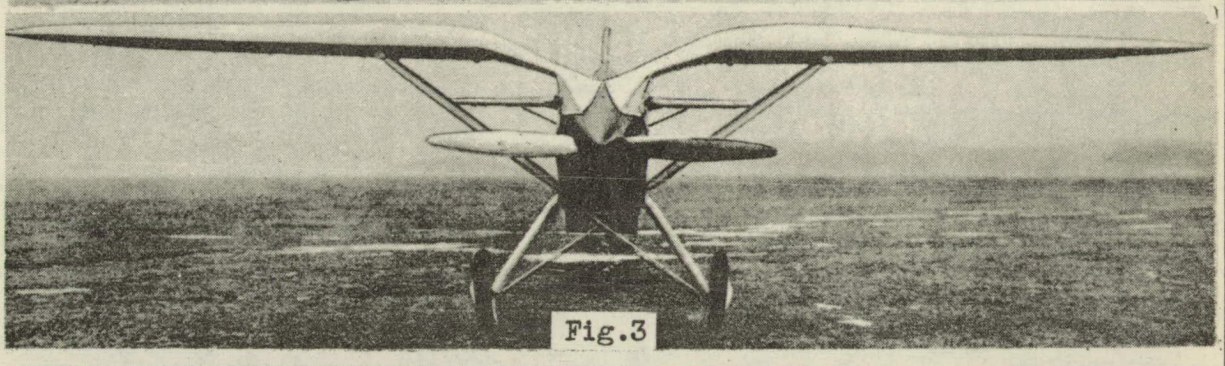


Fig.3

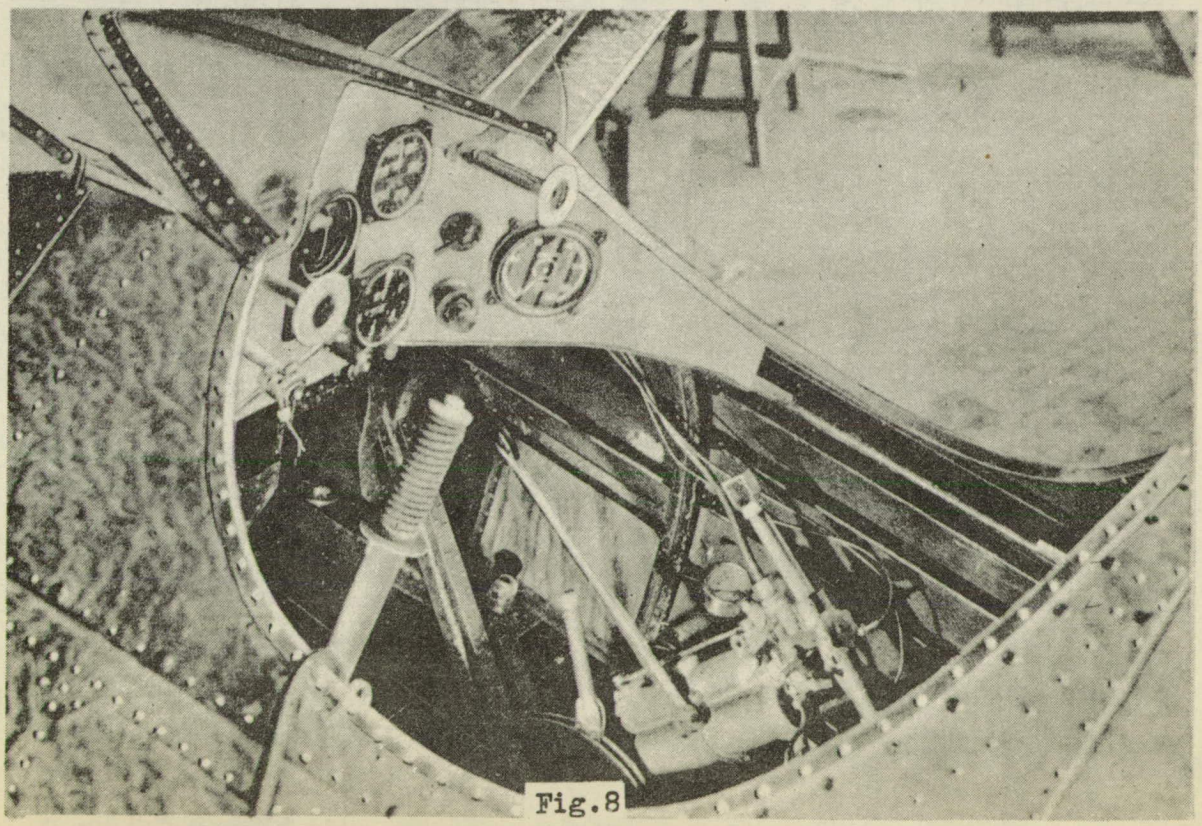
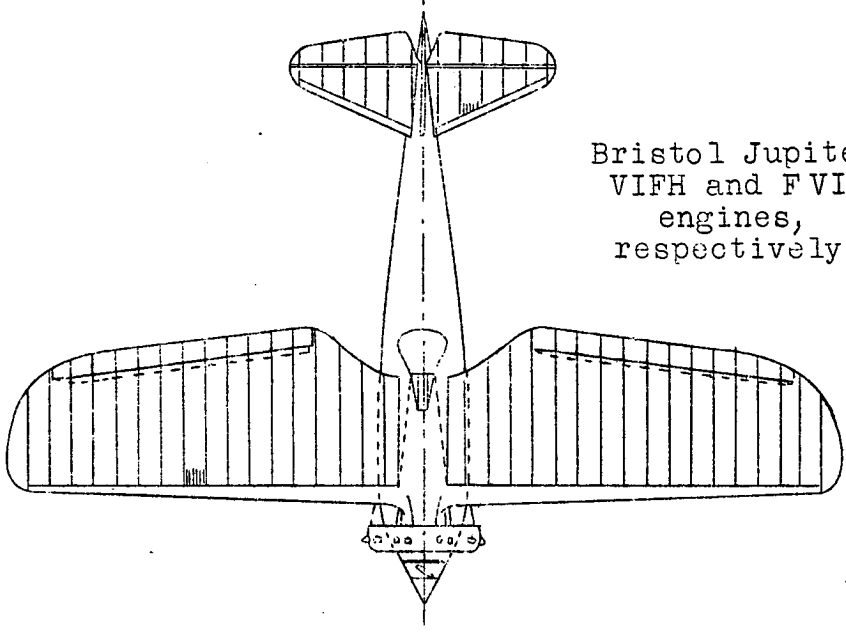
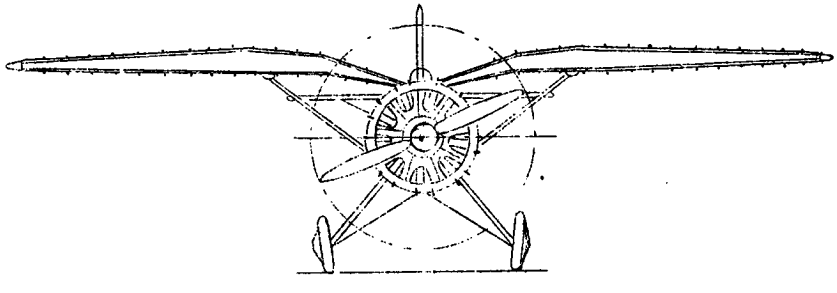


Fig.8



Bristol Jupiter VIFH and F VII engines, respectively

Span	10.3 m (33.79 ft.)	Wing area	17.3 m^2 (186.22 sq.ft.)
Height	2.75 m (9.02 ft.)		
Length	7.16 m (23.49 ft.)		



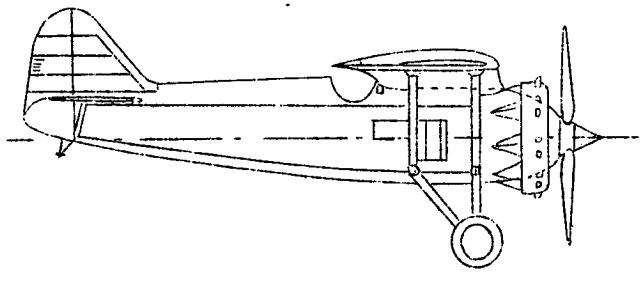


Fig.4 The P VI and P VII single-seat-fighter airplane.

Fig.5

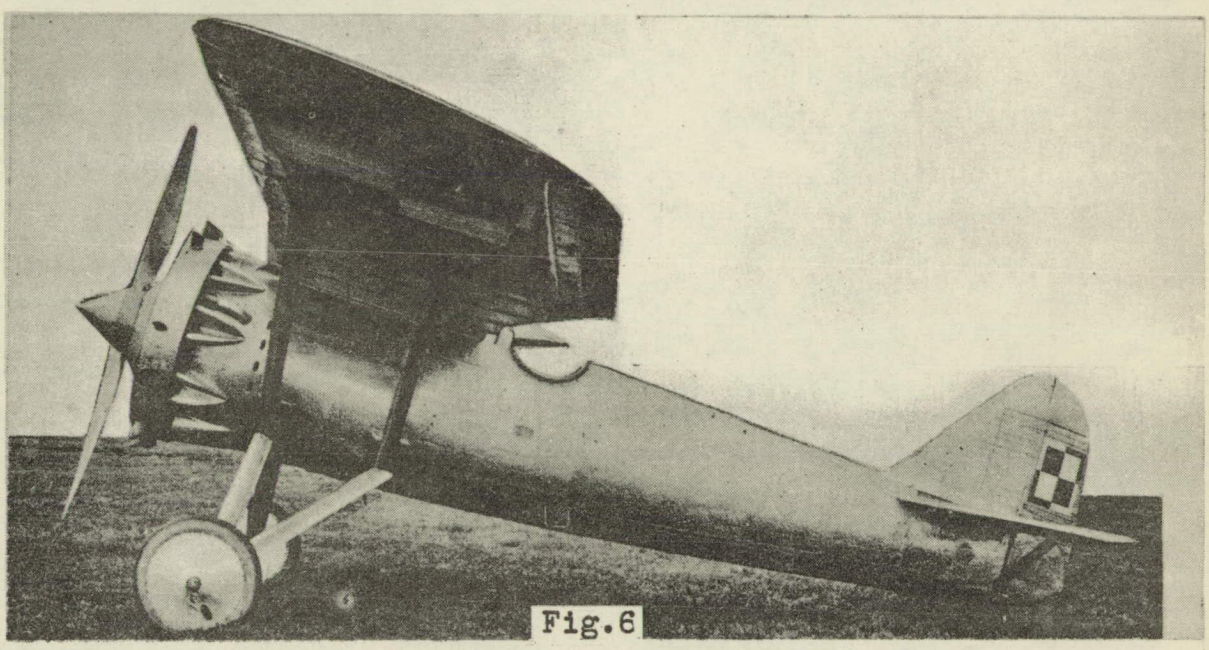


Fig.6

Fig.7

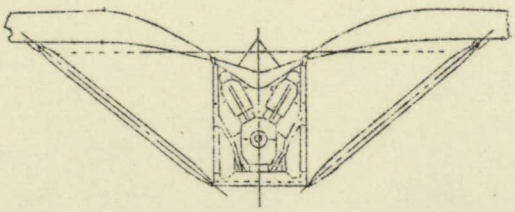


Fig. 9 Exceptional view obtained by the special design of the center section and wing. (Taken from Engineering, July 1930.)

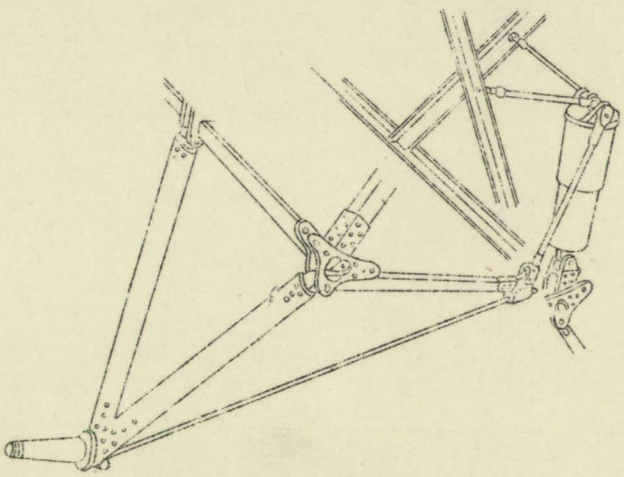


Fig. 10